

Tunable Terahertz Source

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Abstract

Several future NASA and ESA missions include observational targets that require heterodyne receivers operating in the submillimeter frequency regime (1 to 3 THz). Very capable low-noise heterodyne mixers have been identified for many of these applications, but the current lack of solid-state local oscillator sources prohibits compact instrument implementations at present. A promising avenue, submillimeter-wave generation by means of optical-heterodyne mixing, has been pursued for a number of years. This approach has shown capable of achieving output power levels on the order of hundreds of nanowatts. While insufficient to be used as a local oscillator source, these photomixers have the desirable characteristics of being broad-band frequency tunable.

We have initiated a development effort at JPL, in collaboration with UCSB and Caltech, to pursue a new class of these photomixers, which alleviate some of the key shortcomings of earlier designs. The primary focus of our activity is in the following areas:

- introduce a distributed gain region and membrane technology to increase the output power of the device above 1 THz
- synthesize novel materials which can be used at wavelengths suited to Space-based implementations

We will present our ongoing work in this field and report on the current status of the work.